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10/017,073	12/07/2001	Nagabhushana T. Sindhushayana	010015	6210

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Qualcomm Incorporated
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EXAMINER	
PERILLA, JASON M	

ART UNIT	PAPER NUMBER
2634	

DATE MAILED: 03/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/017,073	SINDHUSHAYANA ET AL.	
	Examiner	Art Unit	
	Jason M Perilla	2634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 December 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6,8-10 and 12-24* is/are rejected.

7)☒ Claim(s) *5,7 and 11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 December 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-24 are pending in the instant application.

Drawings

2. The drawings are objected to because parts of the drawings are illegible. Namely, the text and reference numbers in figure 1 are difficult to read, the shaded portion of figure 3 is illegible, the text of figure 4 is illegible because it is too small and unclear, and the text and reference numbers of figure 5 are difficult to read easily.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claims 4-13, 15, and 20-24 are objected to because of the following informalities:

Regarding claim 4, "the phase error signal" is lacking antecedent basis, and it makes the claim difficult to interpret.

Regarding claim 6, in line 9, "accumulator, rotator performing" should be replaced by –accumulator performing—or –accumulator, the 8-Phase Shift Keying programmable rotator performing—

Regarding claim 7, in line 2, "the rotator" should be replaced by –the 8-Phase Shift Keying programmable rotator--.

Regarding claim 10, referring to line 9, the claim is objected to for the same reasons as applied to claim 6 above.

Regarding claim 11, in line 2, "the rotator" should be replaced by –the 8-Phase Shift Keying programmable rotator--.

Regarding claim 13, in line 3, "the rotator" should be replaced by –the 8-Phase Shift Keying programmable rotator--.

Regarding claim 15, in line 2, "accumulated phase increments" should be replaced by –accumulated total phase increment--.

Regarding claim 20, referring to line 13, the claim is objected to for the same reasons as applied to claim 6 above.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3, 4, 10, 12-16, and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Bucher et al (US 5696797; hereafter "Bucher").

Regarding claim 1, Bucher discloses by figure 1 a searcher (10) for finding the frequency of a received signal (12) comprising a phase error (abstract), the searcher comprising: a frequency locked loop (fig. 1, ref. 50; col. 5, lines 3-9) that generates a phase increment signal (output of frequency discriminator 50) in response to the phase error (output of low pass filter 40; col. 5, lines 20-35) of the received signal; and a programmable rotator (30; col. 3, lines 65-67) coupled to the frequency locked loop, the programmable rotator performing a phase rotation function in response to the phase increment signal (col. 5, lines 49-53) which is coupled to the integrator (54) and numerically controlled oscillator (NCO) accumulator (56) and further coupled to the rotator (30; col. 3, lines 62-63).

Regarding claim 3, Bucher discloses the limitations of claim 1 as applied above. Further, Butcher discloses that, as broadly as claimed, the programmable rotator (30) is a Quadrature Phase Shift Keying rotator because it acts upon a received signal which is quadrature phase shift key modulated as the preferred embodiment of the disclosure (col. 3, lines 5-10; col. 3, lines 23-25).

Regarding claim 4, Bucher discloses the limitations of claim 1 as applied above. Further, Bucher discloses a phase error accumulator (fig. 1, refs. 54 and 56; col. 5. lines 10-20) coupled to the phase error signal (fig. 1, output of low pass filter 40; col. 5, lines

20-35), the phase error accumulator accumulating phase error signals from the frequency locked loop and generating a control signal that instructs the programmable rotator to perform the phase rotation function (col. 5, lines 49-61).

Regarding claim 10, the limitations of the claim are disclosed by Butcher as applied to claim 3 (dependent upon 1) above.

Regarding claim 12, Butcher discloses the limitations of claim 6 as applied above. Further, Butcher discloses that the accumulator accumulates phase increment signals over a burst length until the "burst done signal" (fig. 2; col. 5, lines 16-20). The burst length (fig. 2; col. 2, lines 44-45) illustrated in figure 2 is comprised of symbols (18) or chips and one burst may be comprised of any number of symbols (col. 3, lines 7-10). Therefore, it is at least implied that the number of symbols or chips in a burst length or accumulation could be 64 or any other number.

Regarding claim 13, Butcher in view of discloses the limitations of claim 6 as applied above. Further, as understood by one having ordinary skill in the art, the numerically controlled oscillator (NCO) (fig. 1, ref. 56) comprises the means of the phase error accumulator (fig. 1, refs. 54 and 56) for generating an initial phase signal coupled to the programmable rotator (fig. 1, ref. 30; col. 3, lines 58-60). One skilled in the art understands that, upon start of the apparatus, some type of initial phase signal must be generated, and it is generated according to the NCO (fig. 1, ref. 56).

Regarding claim 14, Butcher discloses by figure 1 a searcher method for finding a signal (12) having a frequency deviation from an expected frequency (abstract), the method comprising the steps of: initializing the searcher on predetermined frequency

bins; determining a phase error in the signal (fig. 1, output of low pass filter 40; col. 5, lines 20-35); generating a phase increment (output of frequency discriminator 50) in response to the phase error; accumulating the phase increments (fig. 1, refs. 54 and 56; col. 5. lines 10-20) to generate a total phase increment; and when the total phase increment has reached a predetermined total phase increment threshold (col. 5, lines 17-20 and 38-40), performing a phase rotation function that is substantially equivalent to the total phase increment (col. 5, .lines 31-35 and lines 49-51). It is at least implied or inherent that an initial predetermined frequency bin would be utilized for the searcher because it is evident that a starting or initial frequency must be used by the method of Butcher. The predetermined total phase increment threshold is considered to be the phase increment accumulated over the "burst". Therefore, the threshold is the burst length regardless of the amount of phase offset increments accumulated over the burst period.

Regarding claim 15, Butcher discloses the limitations of claim 14 as applied above. Further, Butcher discloses the step of resetting the accumulated phase increments or dumping the accumulation integrator after performing the phase rotation function (col. 5, lines 50-53).

Regarding claim 16, Bucher discloses the limitations of claim 1 as applied above. Further, Butcher discloses that, as broadly as claimed, the phase rotation function (30) is a Quadrature Phase Shift Keying rotation function because it acts upon a received signal which is quadrature phase shift key modulated as the preferred embodiment of the disclosure (col. 3, lines 5-10; col. 3, lines 23-25).

Regarding claim 19, Butcher discloses the limitations of claim 14 as applied above. In a QPSK receiving method, as understood by one having ordinary skill in the art, the phase rotation function would ideally have a total phase increment of $\pi/2$ radians which provides for the 4 possible phase shifts in the 2π phase space. It would have been obvious to one having ordinary skill in the art at the time which the invention was made to limit the total phase increment in QPSK modulation receiver method to $\pi/2$ radians so that symbols are correctly demodulated. That is, if the phase rotation was greater that $\pi/2$ radians, the demodulation of the received symbols may make incorrect symbol decisions.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 2, 6, 8, 9, 17, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Butcher in view of Heikkila et al (US 6700926; hereafter "Heikkila).

Regarding claim 2, Butcher discloses the limitations of claim 1 as applied above. Butcher discloses a receiver of a QPSK modulated signal (fig. 3) but does not disclose expressly that received signals are 8-Phase Shift Key modulated although alternative modulation orders are suggested and deemed applicable as understood by one having skill in the art (col. 4, lies 19-28). Further, Heikkila teaches an 8-Phase Shift Key

symbol modulation technique (fig. 2) which is capable of transmitting three bits per symbol rather than the two bits per symbol transmitted by a QPSK symbol. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to utilize 8-Phase Shift Key modulation instead of QPSK modulation for at least the reason that it increases the data rate of a communications link. Applicant has not disclosed that the use of a particular modulation technique provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Butcher's invention to perform equally well with the 8-Phase Shift Key symbol modulation technique of Heikkila because it is easily demodulated with a complex demodulator as disclosed by Butcher. Therefore, it would have been obvious to one of ordinary skill in the art to modify Butcher to utilize 8-Phase Shift Key symbol modulation as taught by Heikkila.

Regarding claim 6, Butcher discloses by figure 1 a searcher (10) for finding the frequency of a received signal (12) comprising a phase error (abstract), the searcher comprising: a frequency locked loop (fig. 1, ref. 50; col. 5, lines 3-9) that generates a phase increment signal (output of frequency discriminator 50) in response to the phase error (output of low pass filter 40; col. 5, lines 20-35) of the received signal; a phase error accumulator (fig. 1, refs. 54 and 56; col. 5. lines 10-20) coupled to the frequency locked loop, the phase error accumulator accumulating a plurality of phase increment signals and generating a control signal in response to the accumulated phase increment signals (col. 5, lines 49-61); and a QPSK programmable rotator (30; col. 3, lines 62-63), as applied to claim 3 above, coupled to the phase error accumulator performing a phase

rotation function in response to the control signal (col. 3, lines 5-10; col. 3, lines 23-25). Butcher discloses a receiver of a QPSK modulated signal (fig. 3) but does not disclose expressly that the received signals are 8-Phase Shift Key modulated although alternative modulation orders are suggested and deemed applicable as understood by one having skill in the art (col. 4, lies 19-28). Further, Heikkila teaches an 8-Phase Shift Key symbol modulation technique (fig. 2) which is capable of transmitting three bits per symbol rather than the two bits per symbol transmitted by a QPSK symbol. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to utilize 8-Phase Shift Key modulation instead of QPSK modulation for at least the reason that it increases the data rate of a communications link. Applicant has not disclosed that the use of a particular modulation technique provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Butcher's invention to perform equally well with the 8-Phase Shift Key symbol modulation technique of Heikkila because it is easily demodulated with a complex demodulator as disclosed by Butcher. Therefore, it would have been obvious to one of ordinary skill in this art to modify Butcher to utilize 8-Phase Shift Key symbol modulation as taught by Heikkila and, thereby, to replace the QPSK programmable rotator by an 8-Phase Shift Key programmable rotator.

Regarding claim 8, Butcher in view of Heikkila disclose the limitations of claim 6 as applied above. Further, Butcher disclose that the accumulator accumulates phase increment signals over a burst length until the "burst done signal" (fig. 2; col. 5, lines 16-20). The burst length (fig. 2; col. 2, lines 44-45) illustrated in figure 2 is comprised of

symbols (18) or chips and one burst may be comprised of any number of symbols (col. 3, lines 7-10). Therefore, it is at least implied that the number of symbols or chips in a burst length or accumulation could be 64 or any other number.

Regarding claim 9, Butcher in view of Heikkila disclose the limitations of claim 6 as applied above. Further, as understood by one having ordinary skill in the art, the numerically controlled oscillator (NCO) (fig. 1, ref. 56) comprises the means of the phase error accumulator (fig. 1, refs. 54 and 56) for generating an initial phase signal coupled to the programmable rotator (fig. 1, ref. 30; col. 3, lines 58-60). One skilled in the art understands that, upon start of the apparatus, some type of initial phase signal must be generated, and it is generated according to the NCO (fig. 1, ref. 56).

Regarding claim 17, Butcher discloses the limitations of claim 14 as applied above. Further, Butcher discloses the additional limitations of claim 17 as applied to claim 2 above.

Regarding claim 18, Butcher in view of Heikkila disclose the limitations of claim 18 as applied above. Further, for the same reasons as applied to claim 17, above, the method of Butcher may advantageously receive signals modulated with an 8-Phase Shift Key modulation technique. In such a case, as understood by one having ordinary skill in the art, the phase rotation function would ideally have a total phase increment of $\pi/4$ radians which provides for the 8 possible phase shifts in the 2π phase space (fig. 2; Heikkila). It would have been obvious to one having ordinary skill in the art at the time which the invention was made to limit the total phase increment in an 8-Phase Shift Key modulation receiver method to $\pi/4$ radians so that symbols are correctly demodulated.

That is, if the phase rotation was greater that $\pi/4$ radians, the demodulation of the received symbols may make incorrect symbol decisions.

7. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Butcher in view of Gutierrez (US 6285669).

Regarding claim 20, Butcher discloses the limitations including the receiver as applied to claims 1, 6, and 10 as applied above. Butcher does not explicitly disclose a base station that communicates with wireless mobile stations or receivers, the base station comprising: a transmitter that modulates and transmits signals from a network. However, Gutierrez teaches by figure 1A a base station (114) that communicates with wireless mobile receivers (136 and 138) comprising a transmitter (fig. 2B) that modulates and transmits signals (via the base station) from a network (fig. 1A, ref. 116). One skilled in the art is aware of the advantages of the base station transmitter and mobile receiver communications structure being that a plurality of mobile user receivers may access the network remotely without wires. Therefore, it would have been obvious to one having ordinary skill in the art at the time which the invention was made to implement the receiver of Butcher as the mobile receivers of the communications structure of Gutierrez because it would allow them to be able to access a network from a remote location through a base station wirelessly.

Regarding claim 21, Bucher discloses the limitations of claim 20 as applied above. Further, Butcher discloses that, as broadly as claimed, the programmable rotator (30) is a Quadrature Phase Shift Keying rotator because it acts upon a received

signal which is quadrature phase shift key modulated as the preferred embodiment of the disclosure (col. 3, lines 5-10; col. 3, lines 23-25).

8. Claims 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Butcher in view of Gutierrez and in further view of Heikkila.

Regarding claim 22, Butcher in view of Gutierrez discloses the limitations of claim 20 as applied above. Butcher discloses a receiver of a QPSK modulated signal (fig. 3) but does not disclose expressly that received signals are 8-Phase Shift Key modulated although alternative modulation orders are suggested and deemed applicable as understood by one having skill in the art (col. 4, lies 19-28). Further, Heikkila teaches an 8-Phase Shift Key symbol modulation technique (fig. 2) which is capable of transmitting three bits per symbol rather than the two bits per symbol transmitted by a QPSK symbol. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to utilize 8-Phase Shift Key modulation instead of QPSK modulation for at least the reason that it increases the data rate of a communications link. Applicant has not disclosed that the use of a particular modulation technique provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected the system of Butcher in view of Gutierrez to perform equally well with the 8-Phase Shift Key symbol modulation technique of Heikkila because it is easily demodulated with a complex demodulator as disclosed by Butcher. Therefore, it would have been obvious to one of ordinary skill in the art to modify the system of Butcher in view of Gutierrez to

utilize 8-Phase Shift Key modulation and, therefore, an 8-Phase Shift Keying Rotator as taught by Heikkila because it would provide a higher data rate for the system.

Regarding claim 23, Butcher in view of Gutierrez, and in further view of Heikkila disclose the limitations of claim 20 as applied above. Further, the additional limitations of claim 23 are disclosed as applied to claim 18 above.

Regarding claim 24, Butcher in view of Gutuerrez, and in further view of Heikkila disclose the limitations of claim 20 as applied above. Further, the additional limitations of claim 24 are disclosed as applied to claim 19 above.

Allowable Subject Matter

9. Claims 5, 7, and 11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter:

The indication of allowable subject matter is made regarding claims 5, 7, and 11 because the prior art of record does not disclose the use of a shift register being coupled between a phase error accumulator and a programmable rotor wherein the shift register truncates a predetermined number of bits of a control signal.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following prior art of record not relied upon above is cited to further show the state of the art with respect to frequency and phase synchronization loops.

U.S. Pat. No. 4604583 to Aoyagi et al.

U.S. Pat. No. 6366628 to Su et al.

U.S. Pat. No. 6393083 to Beukema.

U.S. Pat. No. 6466566 to De Gaudenzi et al.

U.S. Pat. No. 6282500 to Agrawal et al.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M Perilla whose telephone number is (571) 272-3055. The examiner can normally be reached on M-F 8-5 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (571) 272-3056. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jason M. Perilla
March 2, 2005

jmp

CHIEH M. FAN
PRIMARY EXAMINER